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Ahne

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(54) **IMAGING APPARATUS HAVING INTERFACE DEVICE FOR PRINT MODE SELECTION**

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(52) **U.S. Cl.** **399/85**; 399/81

(58) **Field of Classification Search** 399/81, 399/82, 85, 396; 715/839, 846, 974, 977
See application file for complete search history.

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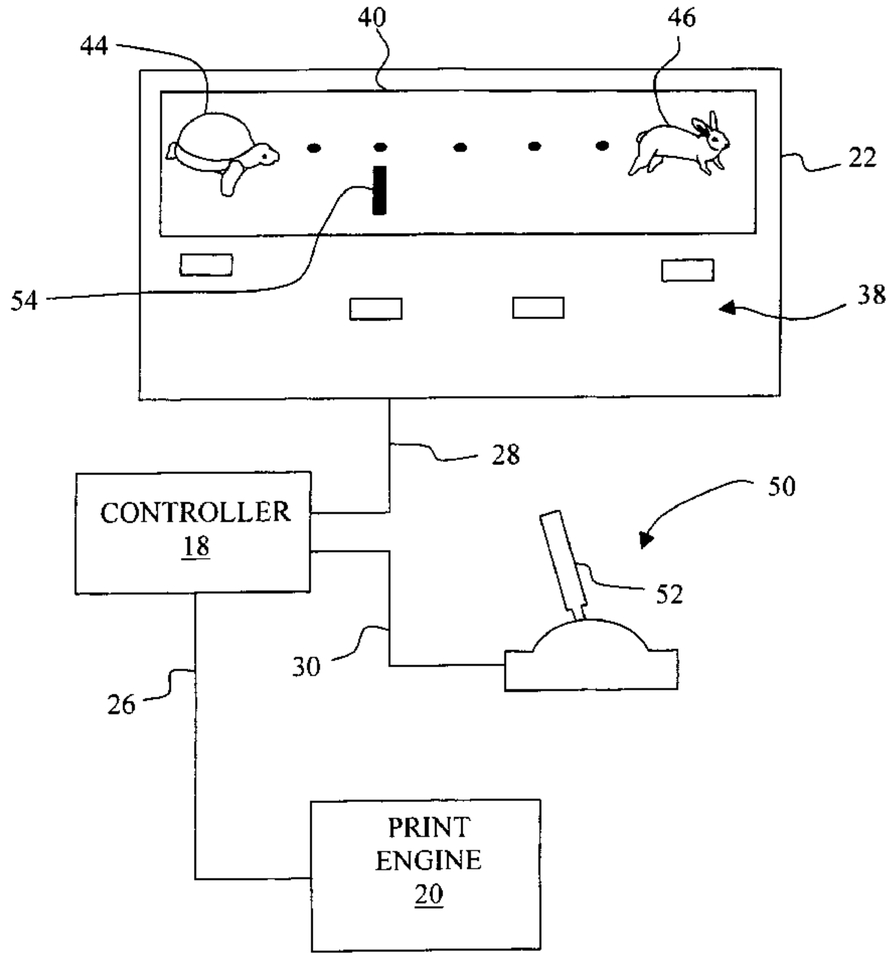
(57) **ABSTRACT**

An imaging apparatus includes a print engine operable in a plurality of print modes. An interface device is communicatively coupled to the print engine. The interface device includes a control lever having a plurality of positions. The plurality of positions corresponds to the plurality of print modes, wherein the control lever is manually manipulated to select a desired print mode of the plurality of print modes.

19 Claims, 4 Drawing Sheets



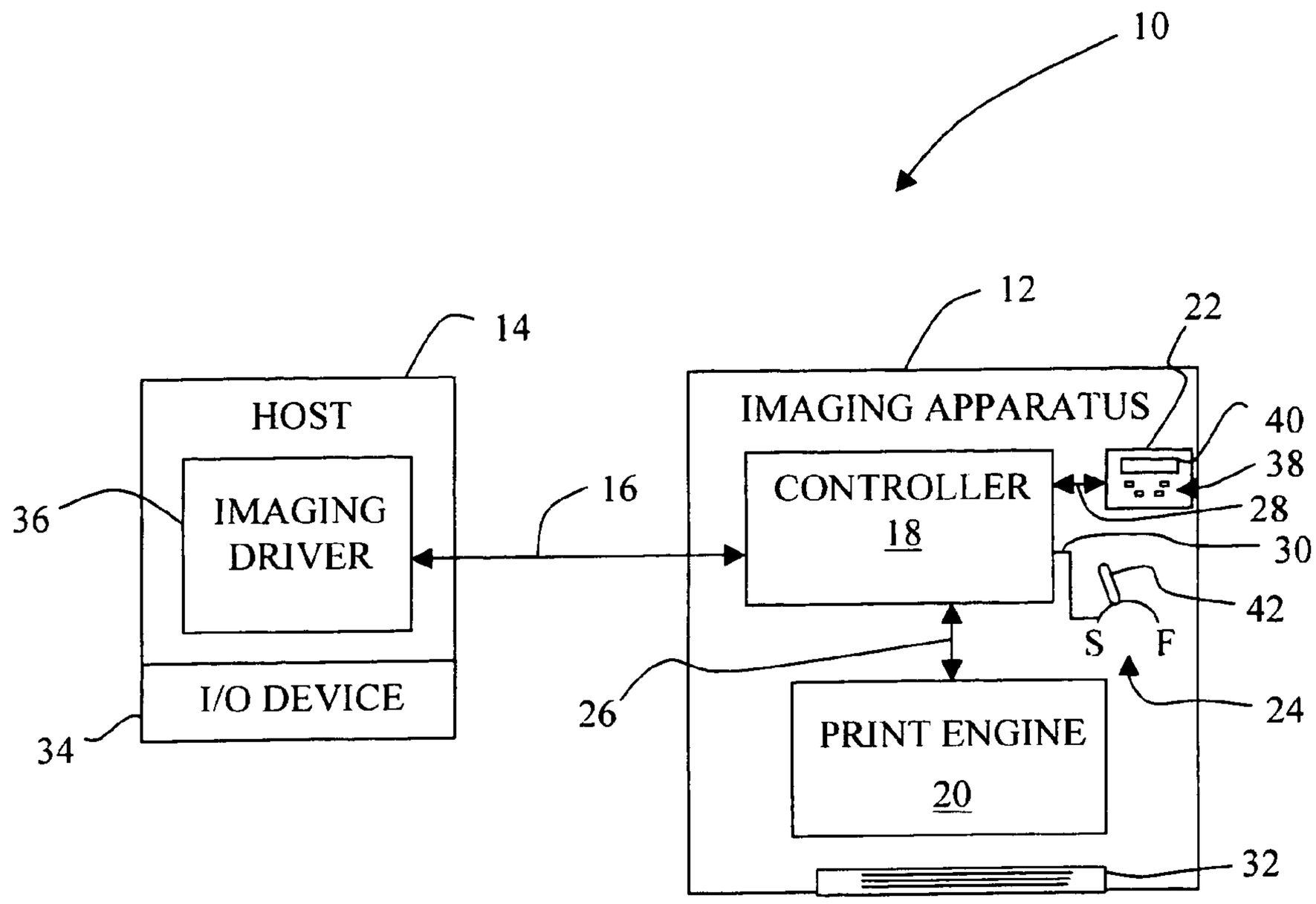

10
12
14
22
HOST
IMAGING APPARATUS
40
38
36
IMAGING DRIVER
16
CONTROLLER 18
28
30
42
S
F
I/O DEVICE
26
24
PRINT ENGINE 20
34
32

Fig. 1

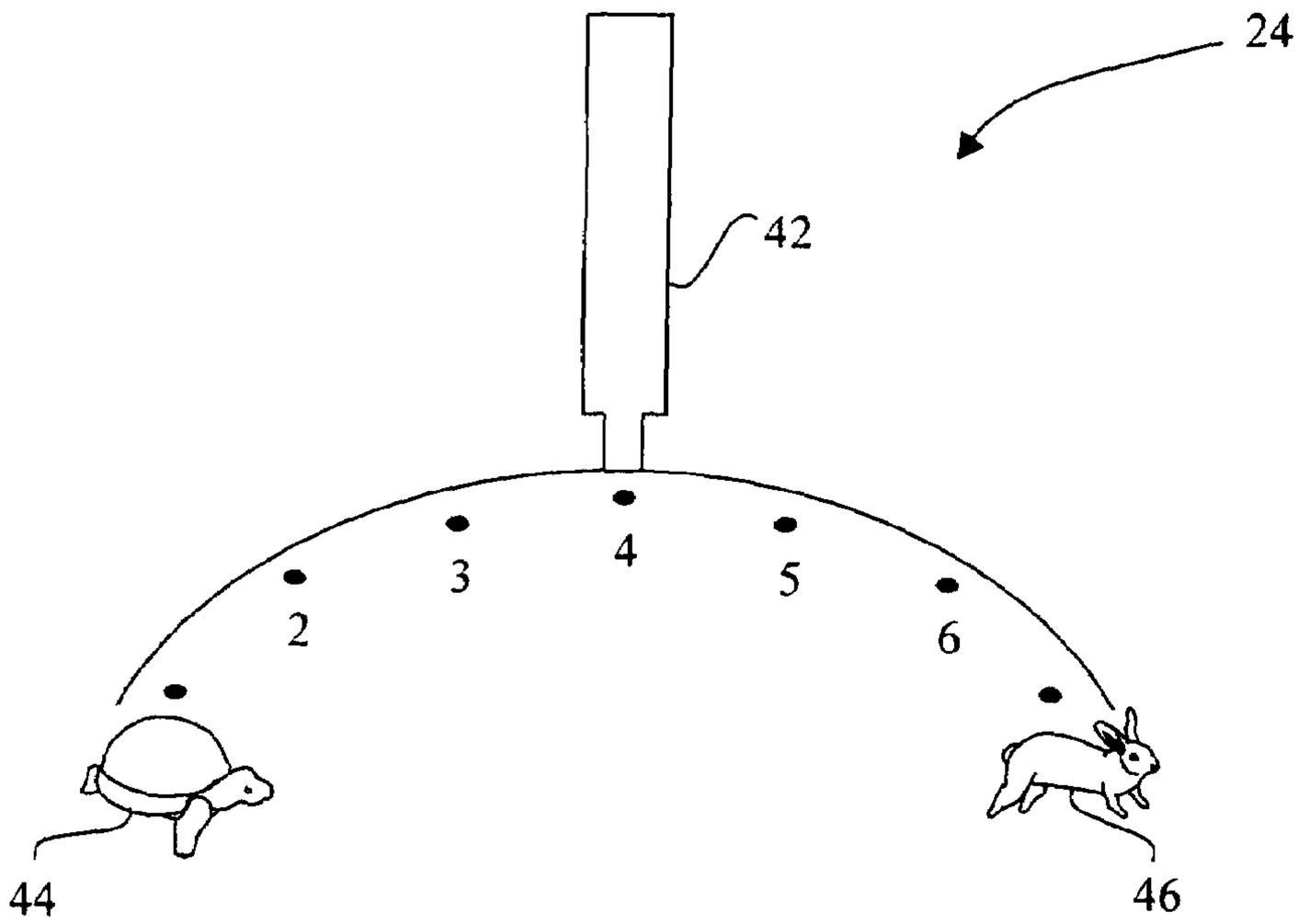


Fig. 2

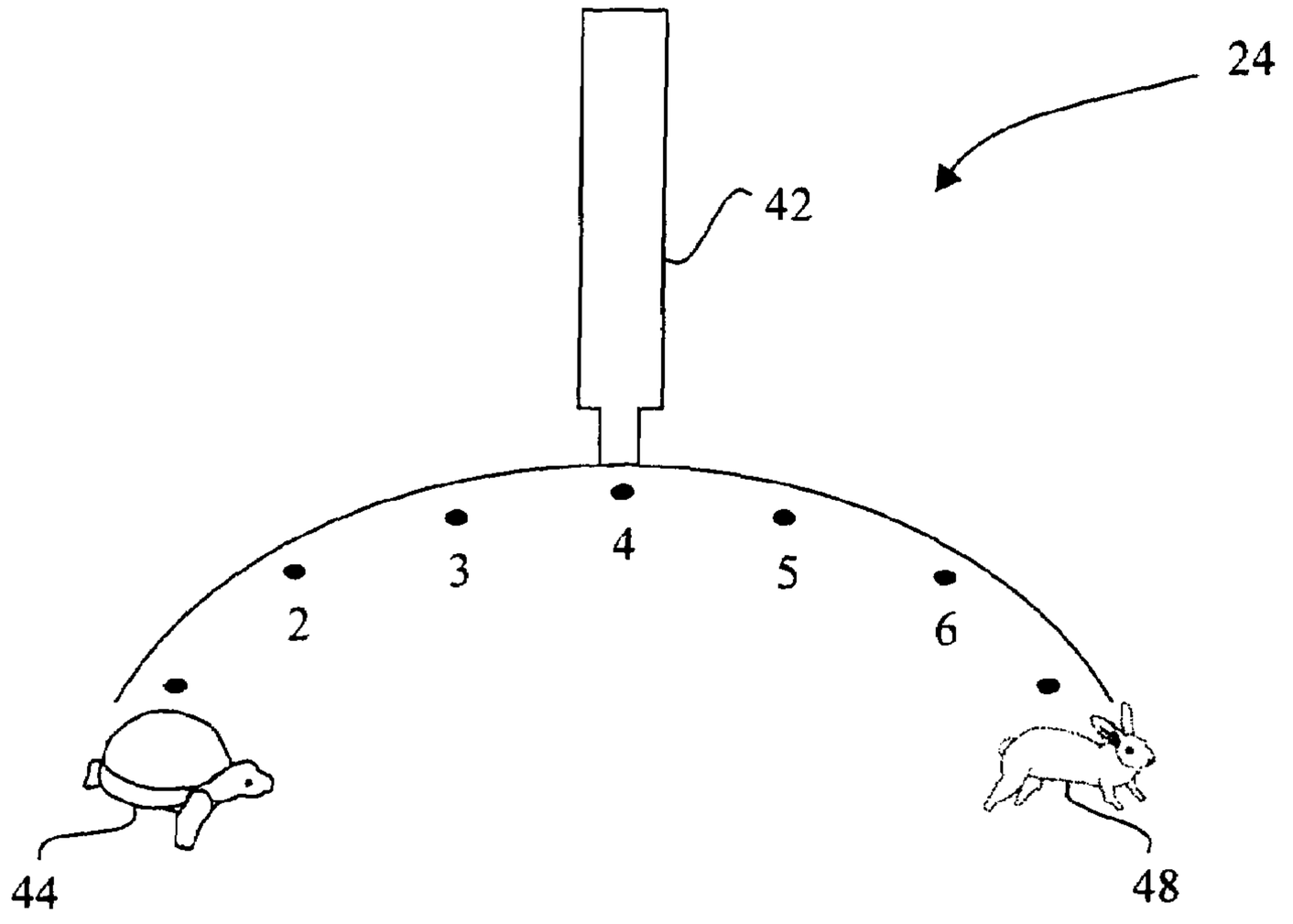


Fig. 3

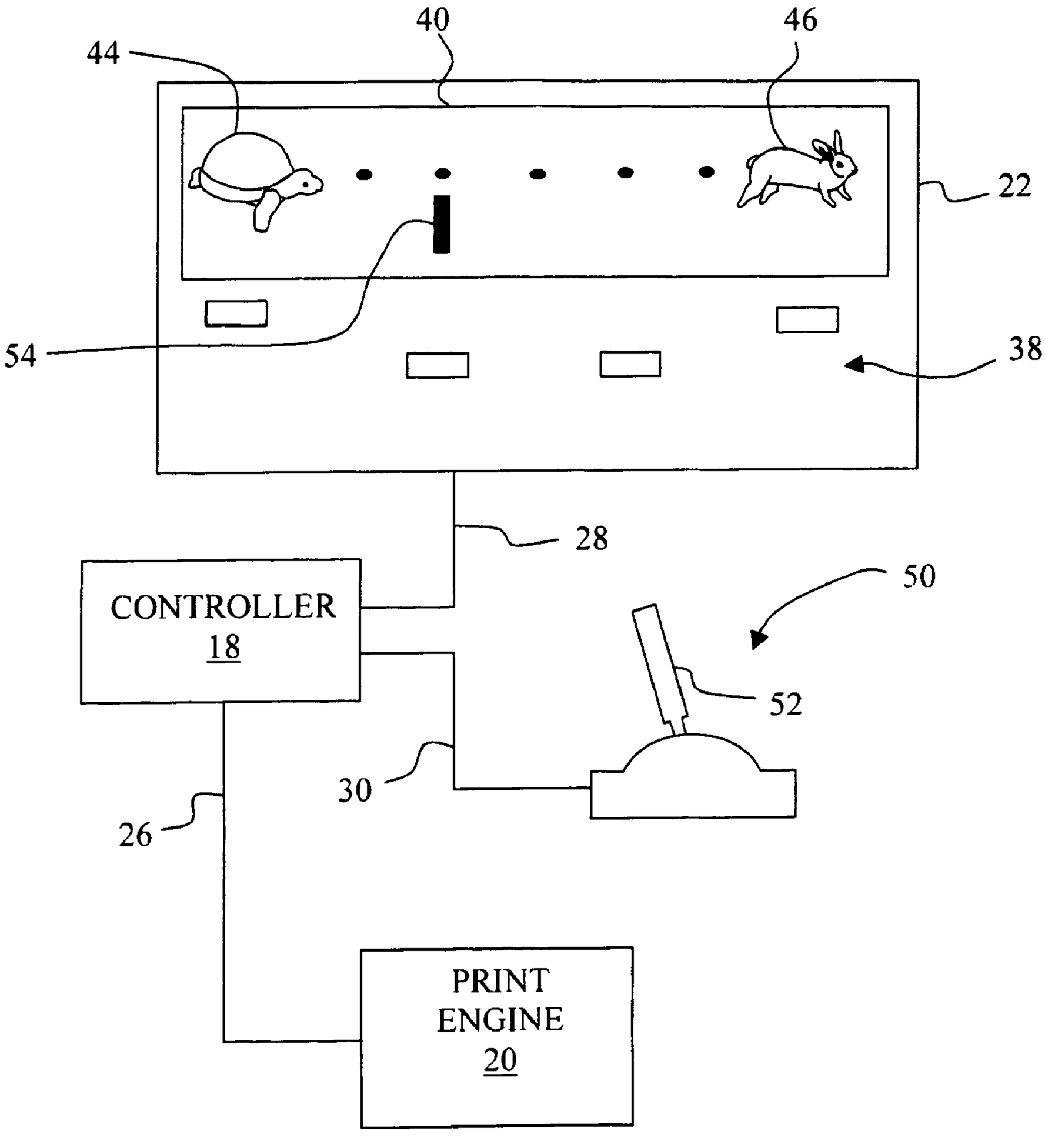


Fig. 4

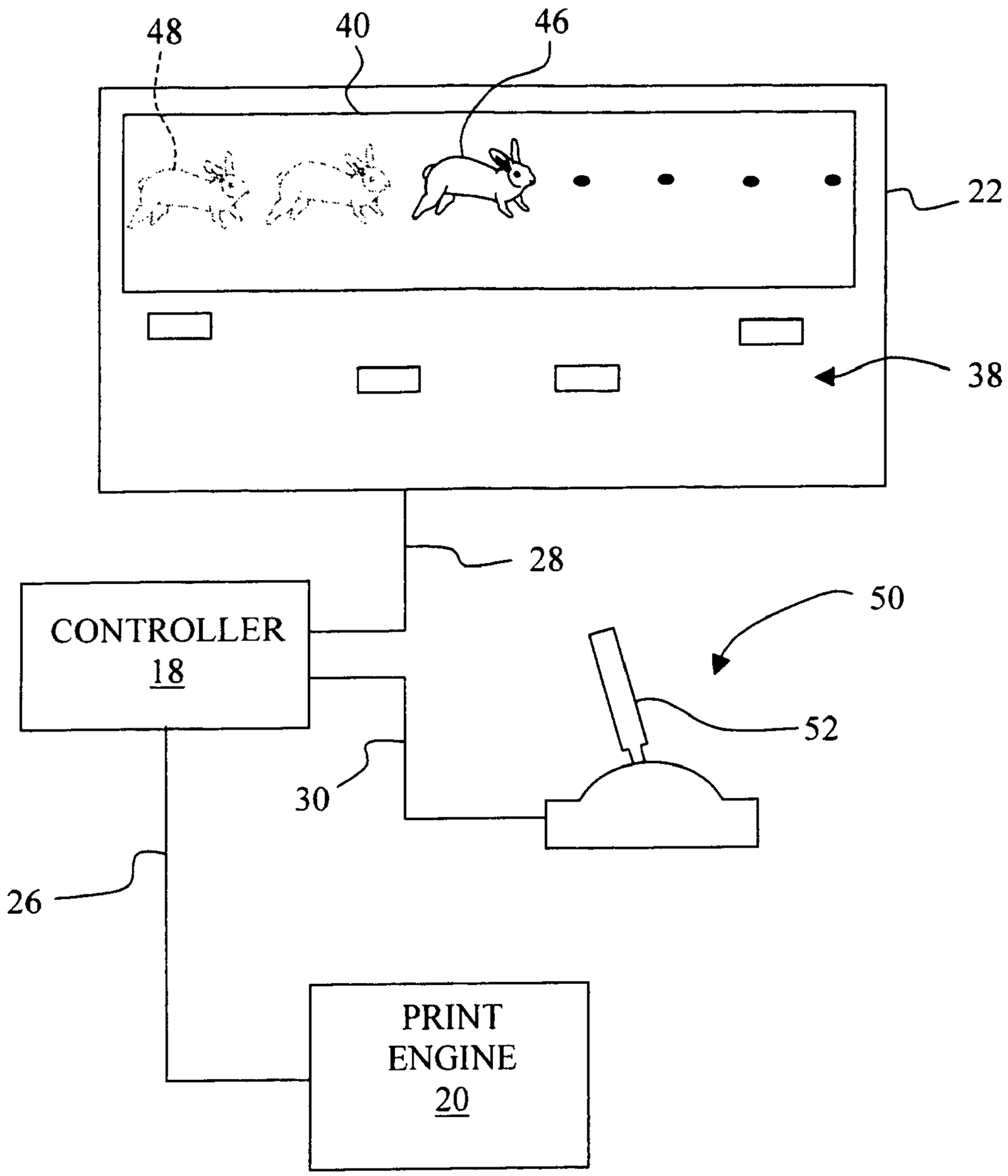


Fig. 5

IMAGING APPARATUS HAVING INTERFACE DEVICE FOR PRINT MODE SELECTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an imaging apparatus, and, more particularly, to an interface device for print mode selection in an imaging apparatus.

2. Description of the Related Art

An imaging apparatus includes a print engine for forming an image on a print medium, such as a sheet of paper. Such a print engine may be, for example, an ink jet print engine or an electrophotographic (EP) print engine. An ink jet print engine may include a reciprocating ink jet printhead carrier that forms an image on a print medium, such as a sheet of paper, transparency or fabric, by selectively ejecting ink from one or more ink jet printheads onto the print medium. An EP print engine may form a latent image on an intermediate substrate, such as a photoconductive drum, which in turn is developed with dry or liquid toner, and then the developed image is transferred to the print medium.

An imaging apparatus typically facilitates printing in a plurality of selectable print modes. Changes in print mode will often affect both printing quality and printing speed, e.g., throughput. For example, improvements in the printing quality of an ink jet printer are commonly realized in print modes providing better, best and photo quality by employing a technique commonly referred to as shingling, or interlaced printing, wherein consecutive printing swaths are made to overlap and only a portion of the ink drops for a given print line, i.e., raster, are applied to the print medium on a given pass of the printhead. In typical shingling methods, however, as printing quality increases, so does the number of passes of the printhead required to print the image data for a given raster, and thus the printing speed, in terms of printer throughput, typically decreases as printing quality increases.

In order for the user to select a print mode for printing an image, a user typically must navigate through a plurality of display screen prompts within their application and/or the printer driver in order to get to the proper screen to effect the selection. Also, sometimes a user may be confused as to how a particular change, for example a change affecting printing quality, will influence printing speed, in terms of throughput.

What is needed in the art is a simple to use and intuitive interface device for mode selection in an imaging apparatus.

SUMMARY OF THE INVENTION

The present invention provides a simple to use and intuitive interface device for mode selection in an imaging apparatus.

The present invention, in one form thereof, is directed to an imaging apparatus. The imaging apparatus includes a print engine operable in a plurality of print modes. An interface device is communicatively coupled to the print engine. The interface device includes a control lever having a plurality of positions. The plurality of positions corresponds to the plurality of print modes, wherein the control lever is manually manipulated to select a desired print mode of the plurality of print modes.

In another form thereof, the present invention is directed to an imaging apparatus. The imaging apparatus includes a print engine operable in a plurality of print modes. An interface device is communicatively coupled to the print engine. The interface device is manually manipulated to select a desired print mode of the plurality of print modes. An icon is provided that is indicative of at least one of the plurality of print modes.

An advantage of the present invention is that it may reduce, or avoid, the need of a user to navigate through a plurality of display screen prompts within their application and/or the printer driver in order to get to the proper screen to make a print mode, e.g., printing speed and/or printing quality, selection.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a diagrammatic representation of a system, including an imaging apparatus, employing an embodiment of the present invention.

FIG. **2** is a diagrammatic representation of an embodiment of a print mode interface device of the imaging apparatus of FIG. **1**.

FIG. **3** is a diagrammatic representation of another embodiment of a print mode interface device of the imaging apparatus of FIG. **1**.

FIG. **4** is a diagrammatic representation of another embodiment of the present invention that utilizes the display screen of the user interface of the imaging apparatus of FIG. **1**.

FIG. **5** is a diagrammatic representation of another embodiment of the present invention that utilizes the display screen of the user interface of the imaging apparatus of FIG. **1** to display an icon that moves across the display screen at an increasing rate of speed as the printing speed increases.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and particularly to FIG. **1**, there is shown a system **10** illustrating one embodiment the present invention. System **10** may include an imaging apparatus **12** and a host **14**, with imaging apparatus **12** communicating with host **14** via a communications link **16**. Alternatively, imaging apparatus **12** may be a standalone unit that is not communicatively linked to a host, such as host **14**. For example, imaging apparatus **12** may take the form of a multifunction machine that includes standalone copying and facsimile capabilities, in addition to optionally serving as a printer when attached to a host, such as host **14**.

Imaging apparatus **12** includes, for example, a controller **18**, a print engine **20**, a user interface **22**, and a print mode interface device **24**, such as for example, a control lever unit.

Controller **18** may include a processor unit and associated memory, and may be formed as an Application Specific Integrated Circuit (ASIC). Controller **18** communicates with print engine **20** via a communications link **26**. Controller **18** communicates with user interface **22** via a communications link **28**. Controller **18** communicates with print mode interface device **24** via a communications link **30**.

Accordingly, print mode interface device **24** in effect is communicatively coupled to print engine **20** via controller **18** and communication links **26** and **30**. Further, in embodiments that include host **14**, which may execute printer driver software, print mode interface device **24** in effect is communicatively coupled to host **14** via controller **18** and communication links **16** and **30**.

Communications link **16** may be established by a direct cable connection, wireless connection or by a network connection such as for example an Ethernet local area network (LAN). Each of communications links **26**, **28** and **30** may be established, for example, by using one of a standard electrical cabling or bus structure, or by a wireless connection.

Print engine **20** is operable in a plurality of print modes, e.g., a plurality of printing speeds and/or printing qualities, as determined at least in part by the imaging data, and the format of the imaging data, received from controller **18**, and a selection made by a user manipulation of print mode interface device **24**.

Print engine **20** may be, for example, an ink jet print engine or an electrophotographic (EP) print engine. As is well known in the art, an ink jet print engine may include a reciprocating ink jet printhead carrier that forms an image on a print medium **32**, such as a sheet of paper, transparency or fabric, by selectively ejecting ink from one or more ink jet printheads onto print medium **32**. The ink jet printheads may be formed integral with an ink supply to form one or more unitary printhead cartridges, which are carried by the ink jet printhead carrier. Also, as is well known in the art, an EP print engine may form a latent image on an intermediate substrate, such as a photoconductive drum, which in turn is developed with dry or liquid toner, and then the developed image is transferred to print medium **32**.

In embodiments of the invention which include host **14**, host **14** may be, for example, a personal computer including an input/output (I/O) device **34**, such as keyboard and display monitor. Host **14** also may include a processor, input/output (I/O) interfaces, memory, such as RAM, ROM, NVRAM, and a mass data storage device, such as a hard drive, CD-ROM and/or DVD units. During operation, host **14** may include in its memory a software program including program instructions that function as an imaging driver **36**, e.g., printer driver software, for imaging apparatus **12**. Imaging driver **36** is in communication with controller **18** of imaging apparatus **12** via communications link **16**. Imaging driver **36** facilitates communication between imaging apparatus **12** and host **14**, and may provide formatted print data, as determined by a selected print mode, to imaging apparatus **12**, and more particularly, to print engine **20**.

Alternatively, however, all or a portion of imaging driver **36** may be located in controller **18** of imaging apparatus **12**. For example, where imaging apparatus **12** is a multifunction machine having standalone capabilities, controller **18** of imaging apparatus **12** may include an imaging driver configured to support a copying function, and/or a fax-print function, and may be further configured to support a printer function. In this embodiment, the imaging driver facilitates communication of formatted print data, as determined by a selected print mode, to print engine **20**.

User interface **22** may include buttons **38** for receiving user input, such as for example, power on, or print media tray selection. User interface **22** may also include a display screen **40** for displaying information relating to imaging apparatus **12**, such as for example, print job status information.

Print mode interface device **24** is provided on imaging apparatus **12** to allow a user to select a desired print mode from among a plurality of print modes, e.g., based on a desired printing speed and/or a printing quality, by positioning a control lever **42** in one of a plurality of positions, e.g., one of two or more positions. Printing quality may be characterized, for example, in terms of printing resolution, and in an ink jet printing environment, the number of printing passes used to print a print swath.

Such positions associated with control lever **42** may be defined in discrete increments. For example, the positions may be in discrete increments of printing speeds, in term of throughput, such as for example 2, 5, 10, 12, etc. pages per minute, or, in discrete increments of printing resolutions, such as for example, 600 dots per inch (dpi), 1200 dpi, 2400 dpi, 4800 dpi, etc. Alternatively, such positions may be represented by a continuous range of positions, e.g., a continuous range of printing speeds from a minimum printing speed to a maximum printing speed, or a continuous range of print resolutions.

Thus, in operation, control lever **42** is manually manipulated by a user to select a desired print mode of the plurality of print modes. Print mode interface device **24** communicates the position of control lever **42**, via communications link **30**, to controller **18**, which in turn executes program instructions, which may be in firmware, to control the operation of print engine **20** according to the print mode selected by the user via control lever **42**. In embodiments that include host **14**, print mode interface device **24** communicates the position of control lever **42** to controller **18**, and to host **14** via communications links **16**, **30** and controller **18**, which in turn execute program instructions, which may be in firmware, so as to control the operation of print engine **20** according to the print mode selected by the user via control lever **42**.

Relative terms relating to the various print modes, e.g., relating to speed and/or print quality, of imaging apparatus **12** are used in describing the present invention. For example, the terms "slow relative printing speed" or "slower relative printing speed" are used to indicate that at least one other printing speed within imaging apparatus **12** exists that is faster. The terms "fast relative printing speed" or "faster relative printing speed" are used to indicate that at least one other printing speed within imaging apparatus **12** exists that is slower. Likewise, the term "relative increase in printing quality" is used to indicate that at least one other printing quality setting within imaging apparatus **12** exists that is of lesser printing quality. The term "relative reduction in printing quality" is used to indicate that at least one other printing quality setting within imaging apparatus **12** exists that has better printing quality.

In one embodiment of the present invention, print mode interface device **24** may include a simple two position switch, wherein control lever **42** is manually positioned at one of the two positions, e.g., slow (S) and fast (F), to select between two print modes, such as for example, a best printing quality that is associated with a slow relative printing speed and a draft printing quality that is associated with a fast relative printing speed.

FIG. **2** shows an embodiment of print mode interface device **24**, wherein each position of the plurality of positions of control lever **42** has associated therewith an icon indicative of a corresponding print mode. In this embodiment, control lever **42** serves as a "throttle" control for imaging apparatus **12**, e.g., a printing speed control. Print mode interface device **24** may include a resistive or capacitive bridge circuit, wherein a change in the position of control

lever **42** will provide a proportional change in resistance or capacitance, which in turn can be correlated by controller **18** to a particular print mode, e.g., a printing quality and/or printing speed.

A shown in FIG. **2**, with respect to the plurality of positions of control lever **42**, a turtle icon **44** may be used to represent one extreme of the plurality of print modes, e.g., a photographic printing quality, wherein the best, i.e., highest, printing quality available from imaging apparatus **12** is provided, but in turn, at the slowest printing speed (e.g., the slowest throughput) of imaging apparatus **12**. Where print engine **20** is an ink jet print engine, for example, the best printing quality is typically associated with a slow relative printing speed, e.g., the slowest printing speed, due to, for example, an increase in the number of printing passes of the printheads in order to complete the printing of an image on print medium **32**. For example, for the best printing quality, controller **18** may select a shingling pattern of 16 passes, e.g., requiring 16 passes of the printhead over the same print line printed on print medium **32** to complete the printing of that particular print line. Thus, the relative printing speed in terms of throughput may be, for example, 5 pages per minute, or lower.

Also, as shown in FIG. **2**, with respect to the plurality of positions of control lever **42**, a rabbit icon **46** may be used to represent another extreme of the plurality of print modes, e.g., a draft printing quality, wherein the draft, e.g., lowest, printing quality available from imaging apparatus **12** is provided, but in turn, at the fastest printing speed (e.g., the fastest throughput) of imaging apparatus **12**. Where print engine **20** is an ink jet print engine, for example, the draft printing quality is typically associated with a fast relative printing speed, e.g., the fastest printing speed, due to, for example, a minimum number of printing passes of each the printheads in order to complete the printing of an image on print medium **32**. For example, for draft printing quality, controller **18** may select a shingling pattern of one pass, e.g., requiring a single pass of the printhead over a particular print line printed on print medium **32** to complete the printing of that particular print line. Thus, the relative printing speed in terms of throughput may be, for example, 12 pages per minute or higher.

As further shown in FIG. **2**, numerals, e.g., **2**, **3**, **4**, **5** and **6**, may be used as indicators of relative printing speed, from a slower relative printing speed to a faster relative printing speed, between turtle icon **44** and rabbit icon **46**. Alternatively, the turtle icon and the rabbit icon may be replaced with other icons, such as the word, SLOW, or character, S, to represent a slow relative printing speed, and the word, FAST, or character, F, to represent a fast relative printing speed. As a further alternative, it is contemplated that icons **44** and **46** may be in the form of a silhouette of a person to represent a photograph for a slowest printing speed, and an icon of a text document to indicate a faster printing speed.

FIG. **3** shows another embodiment of a print mode interface device, e.g., print mode interface device **24**, wherein each position of the plurality of positions of control lever **42** has associated therewith a second rabbit icon **48** indicative of a corresponding print mode, as in FIG. **2**, except in this embodiment rabbit icon **48** is intentionally made to appear out of focus, e.g., "fuzzy", to represent a faster relative printing speed of imaging apparatus **12**, but also the relative reduction in printing quality of imaging apparatus **12** typically associated with a faster relative printing speed. In contrast, turtle icon **44** is intentionally made to appear in focus to represent a slower relative printing speed of imaging apparatus **12**, and a relative increase in printing quality of imaging apparatus **12** typically associated with a slower relative printing speed.

FIG. **4** shows another embodiment of the present invention, wherein a print mode interface device **50** is provided, communicatively coupled to controller **18** via communications link **30**, and thus replaces print mode interface device **24** of FIG. **1**. Print mode interface device **50** may be, for example, a joystick **52**, e.g., a center return control lever. In this embodiment, joy stick **52** is used to effect a change in the print mode, e.g., printing quality and/or printing speed, and display screen **40** of user interface **22** displays the range of available print modes in terms of the icons, such as for example, turtle icon **44**, rabbit icon **46** and/or rabbit icon **48**, described above with respect to FIGS. **2** and **3**. Of course, other icons may be substituted, if desired. As joystick **52** is moved, the position of a cursor **54** changes to indicate on display screen **40** the currently selected print mode, e.g., printing speed.

FIG. **5** shows an alternative embodiment to that of FIG. **4**, wherein the rabbit icon, e.g., one of rabbit icons **46**, **48** may move across display screen **40**, e.g., from left to right, and may move at an increasing rate of speed as the printing speed increases, based on a movement of joystick **52**, and may change for example from the in focus rabbit icon **46**, as the printing speed is increased, to the out of focus rabbit icon **48**.

In still another embodiment, based on the embodiments of FIGS. **4** and **5**, for example, the function of joystick **52** may be performed by one or more of buttons **38** of user interface **22**.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

What is claimed is:

1. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes; and

an interface device communicatively coupled to said print engine, said interface device including a control lever having a plurality of positions, said plurality of positions corresponding to said plurality of print modes, wherein said control lever is manually manipulated to select a desired print mode of said plurality of print modes,

wherein at least one of said plurality of positions has associated therewith an icon indicative of a corresponding printing speed.

2. The imaging apparatus of claim **1**, wherein said icon is a turtle icon to represent a slow relative printing speed of said imaging apparatus.

3. The imaging apparatus of claim **2**, wherein said turtle icon corresponds to a best printing quality available in said imaging apparatus.

4. The imaging apparatus of claim **1**, wherein said icon is a rabbit icon to represent a fast relative printing speed of said imaging apparatus.

5. The imaging apparatus of claim **4**, wherein said rabbit icon corresponds to a lowest printing quality available in said imaging apparatus.

6. The imaging apparatus of claim **4**, wherein said rabbit icon corresponds to a draft printing quality.

7. The imaging apparatus of claim 1, wherein said icon is out of focus to represent a faster relative printing speed of said imaging apparatus, but also a relative reduction in printing quality of said imaging apparatus.

8. The imaging apparatus of claim 7, wherein said icon is a rabbit icon.

9. The imaging apparatus of claim 7, further comprising a turtle icon, said turtle icon being in focus to represent a slower relative printing speed of said imaging apparatus, and a relative increase in printing quality of said imaging apparatus.

10. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes; and

an interface device communicatively coupled to said print engine, said interface device including a control lever having a plurality of positions, said plurality of positions corresponding to said plurality of print modes, wherein said control lever is manually manipulated to select a desired print mode of said plurality of print modes,

wherein at least one of said plurality of positions has associated therewith an icon indicative of a corresponding print mode, said icon being displayed on a display screen associated with said imaging apparatus; and

wherein said icon moves across said display screen at an increased rate of speed as a printing speed of said imaging apparatus increases.

11. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes; and

an interface device communicatively coupled to said print engine, said interface device including a control lever having a plurality of positions, said plurality of positions corresponding to said plurality of print modes, wherein said control lever is manually manipulated to select a desired print mode of said plurality of print modes,

wherein said plurality of positions represent discrete printing resolutions.

12. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes;

an interface device communicatively coupled to said print engine, said interface device being manually manipulated to select a desired print mode of said plurality of print modes; and

an icon indicative of at least one of said plurality of print modes,

wherein said icon is a turtle icon to represent a slow relative printing speed of said imaging apparatus.

13. The imaging apparatus of claim 12, wherein said turtle icon corresponds to a best printing quality available in said imaging apparatus.

14. The imaging apparatus of claim 12, wherein said interface device is a control lever.

15. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes;

an interface device communicatively coupled to said print engine, said interface device being manually manipulated to select a desired print mode of said plurality of print modes; and

an icon indicative of at least one of said plurality of print modes,

wherein said icon is a rabbit icon to represent a fast relative printing speed of said imaging apparatus.

16. The imaging apparatus of claim 15, wherein said rabbit icon corresponds to a draft printing quality.

17. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes;

an interface device communicatively coupled to said print engine, said interface device being manually manipulated to select a desired print mode of said plurality of print modes; and

an icon indicative of at least one of said plurality of print modes,

wherein said icon is out of focus to represent a faster relative printing speed of said imaging apparatus, but also a relative reduction in printing quality of said imaging apparatus.

18. The imaging apparatus of claim 17, wherein said icon is a rabbit icon.

19. An imaging apparatus, comprising:

a print engine operable in a plurality of print modes;

an interface device communicatively coupled to said print engine, said interface device being manually manipulated to select a desired print mode of said plurality of print modes; and

an icon indicative of at least one of said plurality of print modes, said icon being displayed on a display screen associated with said imaging apparatus,

wherein said icon moves across said display screen at an increasing rate of speed as a printing speed increases.

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